



# INSTALLATION & OPERATION MANUAL

**RACE ENERGY**

## **BCM20-12/16** Battery Charger





# IMPORTANT SAFETY INSTRUCTIONS

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■ **SAVE THESE INSTRUCTIONS** — This manual contains important safety and operating instructions for the battery charger.

■ **ALL BATTERY CHARGERS**

- 1) **CAUTION** — To reduce risk of injury, charge only lead acid or sealed gel cell type rechargeable batteries. Other types of batteries may burst causing personal injury and damage.
- 2) Do not expose battery charger to rain or snow.
- 3) Use of an attachment not recommended or sold by the battery charger manufacturer may result in a risk of fire, electric shock, or injury to persons.
- 4) Do not disassemble battery charger; take it to a qualified serviceman when service or repair is required. Incorrect reassembly may result in a risk of electric shock or fire.
- 5) To reduce risk of electric shock, disconnect battery charger from batteries and AC supply before attempting any maintenance or cleaning. Turning off controls will not reduce this risk.

■ **AC BATTERY CHARGERS**

1) **WARNING** — RISK OF EXPLOSIVE GASES.

i) **WORKING IN VICINITY OF A LEAD-ACID BATTERY IS DANGEROUS. BATTERIES GENERATE EXPLOSIVE GASES DURING NORMAL BATTERY OPERATION. FOR THIS REASON, IT IS OF UTMOST IMPORTANCE THAT EACH TIME BEFORE SERVICING EQUIPMENT IN THE VICINITY OF THE BATTERY, YOU READ THIS MANUAL AND FOLLOW THE INSTRUCTIONS EXACTLY.**

ii) To reduce risk of battery explosion, follow these instructions and those published by battery manufacturer and manufacturer of any equipment you intend to use in vicinity of battery. Review cautionary marking on these products and on engine.

2) **PERSONAL PRECAUTIONS**

i) Someone should be within range of your voice or close enough to come to your aid when you work near a lead-acid battery.

ii) Have plenty of fresh water and soap nearby in case battery acid contacts skin, clothing, or eyes.

iii) Wear complete eye protection and clothing protection. Avoid touching eyes while working near battery.

iv) If battery acid contacts skin or clothing, wash immediately with soap and water. If acid enters eye, immediately flood eye with running cold water for at least 10 minutes and get medical attention immediately.

v) **NEVER** smoke or allow a spark or flame in vicinity of battery or engine.

vi) Be extra cautious to reduce risk of dropping a metal tool onto battery. It might

spark or short-circuit battery or other electrical part that may cause explosion.

vii) Remove personal metal items such as rings, bracelets, necklaces, and watches when working with a lead-acid battery. A lead-acid battery can produce a short-circuit current high enough to weld a ring or the like to metal, causing a severe burn.

viii) NEVER charge a frozen battery.

ix) If necessary to remove battery from service, always remove grounded terminal from battery first. Make sure all accessories are off, so as not to cause an arc.

x) Be sure area around battery is well ventilated.

xi) Clean battery terminals. Be careful to keep corrosion from coming in contact with eyes.

xii) Study all battery manufacturer's specific precautions such as removing or not removing cell caps while charging and recommended rates of charge.

xiii) Add distilled water in each cell until battery acid reaches level specified by battery manufacturer. This helps purge excessive gas from cells. Do not overfill. For a battery without cell caps, carefully follow manufacturer's recharging instructions.

### 3) BATTERY CHARGER LOCATION

i) Never place battery charger directly above battery; gases from battery will corrode and damage charger.

ii) Never allow battery acid to drip on battery charger when reading gravity or filling battery.

### 4) O/P CONNECTION PRECAUTIONS

i) Connect and disconnect DC output connections only after setting battery charger switch to off position.

**■ GROUNDING AND AC POWER CORD CONNECTION INSTRUCTIONS** — The plug must be plugged into an outlet that is properly installed and grounded in accordance with all local codes and ordinances.

**■ DANGER** — Never alter the AC cord or plug provided. If it will not fit the outlet, have the proper cord installed by a qualified electrician. Improper connection can result in a risk of an electric shock.



# INTRODUCTION

The **BCM20 – 12/16** Motorsports Battery Charger is designed specifically for racing use. It has the best combination of charge current and compact size for easy use in the pits. The full 3 stage charging profile ensures that the vehicle battery is fully recharged for the next on-track session.

The single board design incorporates state of the art switch mode technology for unmatched efficiency and ultra-quiet operation. Multiple stages of filtering reduce radiated and conducted noise to very low levels. Features include adjustable output voltage, audible and visual indicators for low input voltage, and low output voltage. Safety features include current limiting, and short circuit protection with automatic recovery, input under voltage shutdown, reverse battery protection and output overvoltage crowbar. Two nominal battery voltages are available, 12 and 16 volts. The nominal charging voltage is selectable via a locked toggle switch, conveniently located on the front panel.

## BCM20-12/16 Specifications

### ■ Input Voltages

|                        |           |
|------------------------|-----------|
| Nominal (ip)           | 110       |
| Actual (Vac)           | 105 - 125 |
| Frequency (Hz)         | 45 - 65   |
| Input Amps (max)       | 3.7       |
| Input Fuse (slow blow) | MDA-7     |

### ■ Output Voltages

|                          |              |              |
|--------------------------|--------------|--------------|
| Nominal (op)             | 12           | 16           |
| Float (Vdc)              | 13.6 ± 0.05  | 18.1 ± 0.05  |
| Absorption Voltage (Vdc) | 14.4         | 19.2         |
| Charging Amps            | 20           |              |
| Absorption to Float      | 3.0 Amps     |              |
| Output Adjust            | ± 1.0 Volts  |              |
| Output Fuses             | AGC 25       |              |
| Output Crowbar*          | 16.0 ± 0.5 V | 22.0 ± 1.0 V |

\* The output voltage at which the BCM20 will shut down if an overvoltage condition occurs.

### ■ General

|             |   |
|-------------|---|
| Efficiency  | > 75 % @ maximum output                                 |
| Stages      | 2 or 3 (user selectable)                                |
| Temp. Range | -25 to +40° C @ maximum output                          |
| Isolation   | Input-Case & Input-Output 1500 VDC, Output-Case 500 VDC |
| Length      | 9.6 in / 24.4 cm  |
| Width       | 8.2 in / 20.8 cm  |
| Height      | 3.5 in / 6.4 cm   |
| Clearance   | 1 Inch (2.5 cm) all around                              |
| Material    | Marine Grade Aluminum                                   |
| Finish      | Black Powder Epoxy                                      |
| Fastenings  | 18-8 Stainless  |
| Weight      | 7.0 lb / 3.2 kg   |

Designed and manufactured by:



8128 River Way, Delta, B.C., V4G 1K5, Canada

Toll free 800. 668. 3884

www.raceenergy.net

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Specifications are subject to change without notice.



## INSTALLATION

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The unit is supplied with a 5 foot power cable. This should normally be adequate to connect to a source of power. If you must extend the power cable be sure to use a 3 conductor grounded type extension cable.

The unit's output cable is terminated with an Anderson connector SB175-600. A 6' cable for car mounting is also supplied that allows quick-disconnect at the car interface and is permanently attached to the battery.

This car mounted cable is also available separately from Race Energy. This allows for multiple race cars to be equipped for quick connection of the BCM20 unit.

To ensure **spark free connections** the power switch must be in the **OFF** position prior to making the connections to the battery.

For safety never set the unit on a wet surface or in standing water.



## OPERATION

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Prior to turning on the unit, you must decide on which charging profile, 2 or 3 stage charging, to use. To help you decide, please see the following section entitled **2 or 3 Stage Charging** to determine the charging profile.

Once you have decided on the charging profile you must set the switch to the correct position. The switch is located to the right of the output terminal on the front panel. Set the switch to the correct position as shown on the label.

Select the battery voltage via the locked toggle switch on the front panel, up is 12V and down is 16V. Make sure the switch is in the correct position before turning the charger on. Placing the switch in the 16V position will NOT make a 12V battery charge any faster and could damage or destroy the battery.

To turn the unit on, simply move the power switch to the ON position. The alarm buzzer will sound and the Low Output LED will come on briefly, and then the green OUTPUT ON LED will illuminate.

When the unit is first turned on, it will charge the batteries at maximum current and the charging light will be on. After a period of time which may be minutes to hours, the batteries will reach the absorption voltage (3-stage) or float voltage (2-stage), and the charging current will reduce as necessary to maintain the batteries at that voltage. Once the charging current has dropped to a low level (about 15% of the charging current rating), the charging light will go off, and if set to 3-stage charging the voltage will drop to the float level. You may check this voltage at the output terminals of the unit with a good digital voltmeter.

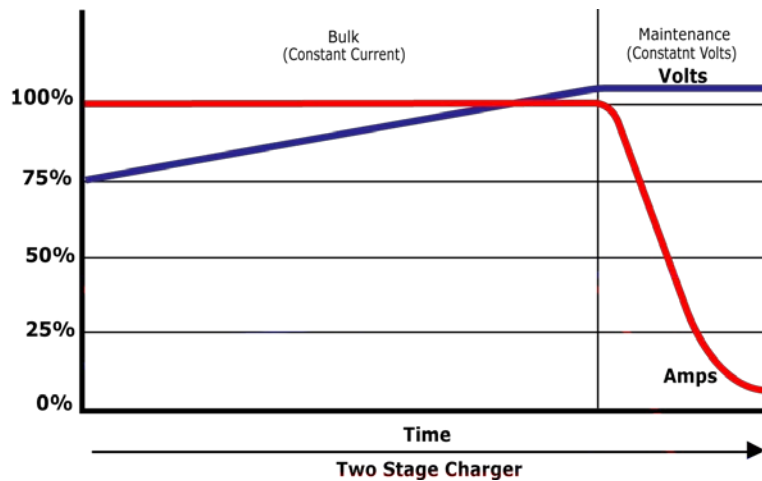
As shipped from the factory, the unit is preset for a float voltage of 13.6 VDC for 12 volt charging or 18.1 VDC for 16 volt charging, which is generally recommended for lead-acid batteries. The output adjust potentiometer is located to the right of the 2 stage / 3 stage select switch. If you wish to adjust this voltage, reach in with a very small flat blade screwdriver to rotate the potentiometer. **Please Note that this adjusts both the float and absorption voltages at the same time.** Clockwise increases the output voltage, and counter clockwise decreases it. It is advisable to check with the battery manufacturer before changing the float voltage.



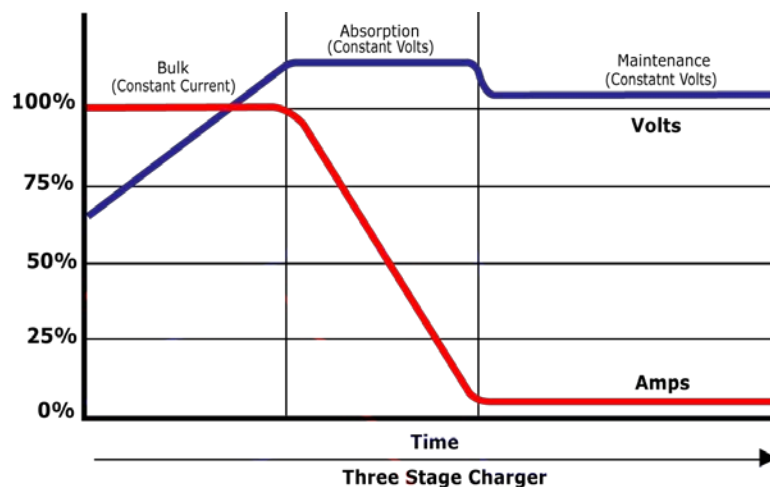
## 2 OR 3 STAGE CHARGING

The **BCM20** charger features a user selectable 2 or 3 stage charging profile. The charging profile is selected by moving the slide switch on the front panel up for 3 stage or down for 2 stage charging.

A **two-stage profile** provides a constant current until the battery reaches its rated capacity and then switches to a "float" voltage. The current then reduces as necessary to maintain the battery at the float voltage. The charger can be connected to the battery indefinitely and will provide the appropriate profile. A two-stage charger is recommended in most instances since it is the most versatile and can be permanently connected to attenuate the characteristic discharge of unused batteries. A load can be put on the battery or batteries without altering its ability to keep the battery at optimal charge.



A **three-stage profile** is the fastest mode of charging. It charges the battery at a constant current until the battery voltage reaches a slightly elevated level. The battery is maintained at this voltage while the charging current diminishes to a low value, and then the battery is switched to the float voltage where it can be maintained indefinitely. However, the charger cannot differentiate between a current going to a load on the battery, or being absorbed by the battery, so it can overcharge a battery supplying current to a load.



A **two-stage** charger is preferred for "loaded" batteries and a **three-stage** for idle or unloaded batteries during recharging.

**Race Energy** recommends using the **three stage** charging profile at the race track, where fast charging is critical.

Use of the **two stage** charging profile is best suited for shop usage where the charger is left connected for long periods and maintains the battery at peak charge.



## EQUALIZE MODE

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The purpose of the Equalize mode is to deliberately overcharge the battery at a low rate of current to ensure that all cells are fully charged and to reduce the chance of sulfation. During the Equalize cycle, the cells, which are fully charged, will produce Hydrogen gas, and the cells, which are undercharged, will be brought up to full charge. An Equalize cycle should be done once every 2-3 months, or whenever battery capacity appears to be diminished.

An Equalize cycle can be initiated at any time by simply pressing the equalize start button located in the hole labeled EQ SEL. This button is deliberately recessed to prevent accidental operation. It is most easily pressed by using a ballpoint pen. If the charger is in the middle of charging the battery (the Charging LED is on), the Equalize LED will flash. Once the main charging cycle is complete, the Equalize cycle will begin and the Equalize LED will stay on all the time. If the Charging LED is off when the button is pressed, the Equalize cycle will begin immediately.

The charger will charge the battery at approximately 10% its normal rate (i.e. 2 amps for a 20 amp charger). The charger will maintain this current until the battery reaches a maximum voltage of 15.5/20.7 volts for 12/16 volt batteries respectively. It will then reduce the current as necessary to maintain the battery at that voltage. Three hours after the Equalize cycle begins, the charger will return to the float mode where the battery can be maintained indefinitely.



## TROUBLESHOOTING

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If the red CHARGER O/T LED is on and the audible alarm sounds, the unit has overheated, and it will shut down until it cools off sufficiently. If necessary, direct a stream of moving air over the unit.

If the yellow LOW VOLT IN LED is on and the audible alarm sounds, the input voltage has dropped below a usable level. Check the AC source, maybe the circuit is overloaded.

If the LOW VOLT OUT LED is on and the audible alarm sounds, and the green OUTPUT ON LED is completely off, the output of the unit has been shorted out, or there has been an internal failure. To check for an internal failure, turn the unit off, disconnect the battery, and turn it back on again. If the unit did not come on normally without the battery connected, the unit is defective and must be returned to the factory or an authorized service center for repair.

If the unit comes on normally with the battery disconnected, check the battery and the cabling to the battery for a short. If a short was found, fix it, turn the unit off again, reconnect the battery and turn it on again.

If the unit will not turn on at all, check the input fuse. To do this, first turn off the unit, disconnect the power cord and disconnect the battery. Remove the fuse and check it with an ohmmeter. If it is blown, replace it with a new one. If that fuse blows as well or the unit still will not turn on, it is defective, and must be returned to the factory or an authorized service center for repair.

If the battery is connected backwards the output fuses will blow. To change them follow the same procedure as for the input fuse.

If both the input and output fuses are good and the unit still does not function it must be returned to the factory for servicing.

# BCM 20-12/16 KIT

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## CABLE OPTIONS

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### BCM20-Cable



Allows the use of the BCM20 with more than one race vehicle.

### BCM20-Allig



Allows the use of the BCM20 with any 12 or 16 volt battery.



## LIMITED WARRANTY

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1. The equipment manufactured by Race Energy, (the "Warrantor") is warranted to be free from defects in workmanship and materials under normal use and service.
2. This warranty is in effect for:
  - a. 3 Years from **date of purchase** by the end user for standard products offered in our catalog.
  - b. 2 Years from **date of manufacture** for non-standard or OEM products
  - c. 1 Year from **date of manufacture** for encapsulated products.
3. Race Energy will determine eligibility for warranty from the date of purchase shown on the warranty card when returned within 30 days, or
  - a. The date of shipment by Race Energy, or
  - b. The date of manufacture coded in the serial number, or
  - c. From a copy of the original purchase receipt showing the date of purchase by the user.
4. In case any part of the equipment proves to be defective, the Purchaser should do the following:
  - a. Prepare a written statement of the nature of the defect to the best of the Purchasers knowledge, and include the date of purchase, the place of purchase, and the Purchasers name, address and telephone number.
  - b. Call Race Energy at 800-668-3884 and request a return material authorization number (RMA).
  - c. Return the defective part or unit along with the statement at the Purchasers expense to the Warrantor; Race Energy, 8128 River Way, Delta, B.C., V4G 1K5, Canada.
5. If upon the Warrantor's examination the defect proves to be the result of defective material or workmanship, the equipment will be repaired or replaced at the Warrantor's option without charge, and returned to the Purchaser at the Warrantor's expense by the most economical means. Requests for a different method of return or special handling will incur additional charges and are the responsibility of the Purchaser.
6. Race Energy reserves the right to void the warranty if:
  - a. Labels, identification marks or serial numbers are removed or altered in any way.
  - b. Our invoice is unpaid.
  - c. The defect is the result of misuse, neglect, improper installation, environmental conditions, non-authorized repair, alteration or accident.
7. No refund of the purchase price will be granted to the Purchaser, unless the Warrantor is unable to remedy the defect after having a reasonable number of opportunities to do so.
8. Only the Warrantor shall perform warranty service. Any attempt to remedy the defect by anyone else shall render this warranty void.
9. There shall be no warranty for defects or damages caused by faulty installation or hook-up, abuse or misuse of the equipment including exposure to excessive heat, salt or fresh water spray, or water immersion except for equipment specifically stated to be waterproof.
10. No other express warranty is hereby given and there are no warranties that extend beyond those described herein. This warranty is expressly in lieu of any other expressed or implied warranties, including any implied warranty of merchantability, fitness for the ordinary purposes for which such goods are used, or fitness for a particular purpose, or any other obligations on the part of the Warrantor or its employees and representatives.
11. There shall be no responsibility or liability whatsoever on the part of the Warrantor or its employees and representatives for injury to any person or persons, or damage to property, or loss of income or profit, or any other consequential or resulting damage which may be claimed to have been incurred through the use or sale of the equipment, including any possible failure of malfunction of the equipment, or part thereof.
12. The Warrantor assumes no liability for incidental or consequential damages of any kind.



8128 River Way, Delta, B.C., V4G 1K5, Canada

**Toll free: 1-800-668-3884**

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